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ABSTRACT

Early identification of Minimal Brain Dysfunction (MBD) is now easier, partly as a result of a series of 3 studies made in rural Vermont over a period of 15 years. MBD victims exhibit different behaviors at different ages. "Fidgetiness", a "nuisance" factor, and poor learning are all strong predictors of MBD for children at the 9th grade level. Especially at the 4th or 5th grade level, children who exhibit MBD behavior for more than a year risk later academic difficulties and other disorders. MBD is sensitive to environmental factors and is aggravated by societal diversity, large families, living in apartments or trailers, and open classrooms. Factors which improve MBD are increased large muscle activity, rigid social structure, single family dwellings, and tightly run classrooms. As adults, individuals with MBD may exhibit alcoholism, criminality, hysterical behavior, and serious deficiencies in the ability to form lasting relationships. In addition, among MBD victims there is a greater trend towards adolescent illegitimate pregnancy; school dropout; lower socio-economic status; poor pre-, para-, and post-natal care; and prematurity. Medication can be effective in the treatment of MBD and should be attempted. (SB)

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Behavior Disorders and Learning Disabilities

over 15 Years in Rural Vermont

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Presently under revision

I would like to share with you our experiences with minimal brain dysfunction over the years in rural Vermont, an area where the problem is not complicated by problems of race or major poverty or ghettoes. We began our studies by surveying all the elementary school children in the first six grades in one county, asking the teachers to identify all the children that they were concerned about. The results are seen in Table I. The four major complaints were slow learner, probably not retarded, fidgety, short attention span and interrupts class. Between these four complaints, they covered 80% of all the children that the schools were concerned about. This was rather an eye opener to us since we had not thought that minimal brain dysfunction was the predominant difficulty amongst elementary school children. The teachers were concerned about 20% of all the children.

We then did an eight to ten year follow-up study of 84 children seen by us in the past whom we had thought suitable for the use of drug therapy. The results are seen in Table II, and as you can see, the outcomes were not very promising. We interpreted this data to tell us that the MBD child is indeed a child at risk for all kinds of later disorders.

Our next study translated the previous two into a teacher questionnaire to be administered to 500 second grade children, all the second graders in a number of rural schools. This questionnaire was then again administered

in the fourth grade and the fifth grade, and then we looked at the children's adjustment in the ninth grade. These questionnaires rated children in regard to hyperkinetic behavior and learning problems. The greater the problems, the higher the score. By rather arbitrary means we decided that all the children with scores above the 80th percentile showed behaviors usually identified with the MBD syndrome. The results of this study are presented in Table III. Children identified in second, fourth and fifth grade as showing the symptoms of MBD are having serious problems in ninth grade. Children who were identified only in second grade are doing quite well, although not nearly as well as children who were never identified as showing the symptoms of minimal brain dysfunction. Children who received consistently low scores, i.e. in the lower 30 percentiles on all three teacher questionnaires, have an unusually high level of adaptation with no social or academic problems and at least one third of them being in advanced classes in either English or math. What the study seems to show is that children who show MBD behaviors for more than one year, particularly at the fourth and fifth grade level, are a population at risk for later difficulties. We use MBD as a label without any commitment to a specific causality or therapy.

Table IV shows some clusters that we obtained from the data. A score of 66 represented a score of the 80th percentile, and as you can see, we were able to find five groups that seemed to have stability over time, with cluster #1 becoming progressively worse, cluster #3 showing gradual improvement, and the other three clusters showing stability over time. We would like to be able to differentiate the high scoring second grader who will get better from the one who will get worse. So far we cannot.

We then looked at these same children's school records in the 12th grade which again shows that the children who had scores above the 80th percentile had poorer adjustments in every area than children who had no scores above the 80th percentile.

After we began this research, Keith Conners developed his now-standard questionnaire for both parents and teachers which has been found to be the most useful diagnostic tool for MBD. To see how well our questionnaire correlated with the one developed by Dr. Conners, the teachers of 350 third and fourth graders filled out both questionnaires. We found that we achieved a correlation coefficient of .77 and that our questionnaire picked up some children with educational handicaps which were not picked up by the Conners questionnaire. Dr. Conners himself states that he feels his questionnaire is deficient in picking up educational handicaps.

Table VII summarizes the ways in which the hyperkinetic children were described in their ninth grade records and contains only items which are not found at all in the ninth grade records of children who never achieved a score above the 80th percentile. There appear to be three predicative factors, a factor of "fidgetiness," a factor which can be best called "nuisance," and a factor related to poor learning. The combination of all three factors is a far superior predictor of later performance than any one of them by themselves. Looking at Table VII makes clear that these children are different. We tried various different percentiles as cut-off points for segregating the problem children from the non-problem children, and the computer tells us that the 80th percentile is the best cut-off point.

A further finding is that rather than there being MBD children and non-MBD children, the behaviors picked up by these questionnaires are distributed on a standard curve of distribution. Our clinical experience makes clear that children can move up and down this curve in response to various environmental factors. In our attempts to treat these children, we found that they often responded to small doses of imipramine and reported this in 1970.

The results of these studies led us to look for adult hyperkinetics, and Table VIII shows the results of 142 drug trials in 64 adults who have symptoms or childhood histories of MBD. The results show that adults with these symptoms respond very similarly to children, and also that the variability of response is similar to our experience with children, namely children may respond to one of the stimulant drugs but not to another and there is no way of predicting which medication a particular individual will respond to.

As part of this study, we came upon the interesting finding that grown-up female MBD's seem to be particularly sensitive to fluid retention before their menstrual periods and may receive dramatic help from the use of a diuretic for a few days before their periods. With the judicious use of a diuretic, we found stimulants were seldom needed.

The fear that these drugs interfere with height and weight gains is not born out by our own data. I believe these children are characterised by erratic height and weight curves which makes this question an extremely difficult one to answer with any certainty.

People often express the opinion that only early aggressive behavior has a poor prognosis. The studies above would not bear this out. Table IX

summarizes some of the environmental factors which our experience has shown either aggravate MBD or improve the behavior of children with MBD. I believe Table IX helps to explain why MBD presents a much greater problem to us in the United States than in western Europe and in turn a greater problem in western Europe than in more rigidly organized societies. The diversity in our society, the various acceptable life styles, and our tendency towards the open classroom all make life more difficult for the MBD child, and it would appear that the problem is becoming greater in western Europe as their social structure becomes more varied.

Table X tries to show the different presenting behaviors at different ages for MBD. The work of Prechtl, Waldrop, Thomas, Chess and Birch, and Brazelton make it clear that we could identify many of these children very early in life. The question is what should we be doing about it? Does early treatment alter adult outcome? Is there a "too late" for treatment? If it is symptom control only, does prolonged control of symptoms alter final outcome? Our experience with adults leads us to postulate that a crucial dimension in MBD has to do with the individual's relationship to time. These children and adults live in the moment. We have experienced adults, whose behavior was greatly improved by medication, coming back and saying that they would not take the medication anymore. Whereas the drug abuser uses medication to tune out temporarily to live in the moment, with the MBD person, if the medication works, it tunes him in and prevents him from being able to live in the moment. Apparently if one has not grown up with an internal tolerance for stress and frustration, when the medicine suddenly gives one this privilege, it is not particularly attractive. Our patients never want more. They continually want to stop their medication.

Nobody wants to become super-responsible. One question which we cannot answer at all yet is whether age influences the drug which may help.

Since a tight social structure helps these individuals get along better, our negative attitude towards institutions may reflect our prejudices more than reality. A tightly run institution may be the best treatment for one of these children. The institution may not be a place to hold the child so that treatment can be applied, but rather the institution itself is the treatment.

Table XI shows the standard curve of distribution of MBD behaviors and shows factors which have been shown to be associated with the prevalence of MBD. The fact that MBD has a better outcome in families of higher socioeconomic status is related to the resources available to help parents deal with a difficult situation. The same is true for cases of paranatal insult.

The usual model is a problem family producing a problem child. We would say that often a problem child may produce a problem family. Although we do not have the evidence, everything I believe convinces me that allowing one of these children to go through school with reasonable academic and social success should produce a better outcome than having the child continually in academic and social difficulty. For this reason I'm very ready to use medication if it helps.

Amongst the adult outcomes of this disorder are alcoholism, criminality, hysterical personality, conditions for which we have few treatment resources. Many of these individuals show serious deficiencies in their ability to form lasting relationships. I sometimes think that this may be one of the most important prognostic indicators. Is this disability based on the symptoms

of MBD, i.e., is it the result of MBD or is it an essential ingredient of MBD or only of some cases of MBD. If a large part of MBD is hereditary, then this would account for the higher incidence of maladaptive problems amongst adopted children. Adolescent MBD individuals are more likely to become involved in illegitimate pregnancy, and most adopted children originate in illegitimate pregnancies and therefore would have an unusually heavy genetic loading for MBD. Individuals with MBD do not achieve as high a socioeconomic status as their non-MBD siblings. MBD's drop out of school, get involved at a high rate in delinquency and crime and have unstable job histories, so they will be over-represented amongst the poor. Further, poor pre-, para-, and postnatal care is much more common amongst the poor and again is strongly associated with MBD. Prematurity is more common amongst the poor and again is associated with MBD. (Smoking and drinking in mothers have been shown to have negative influences on their offspring. Excesses in both of these are more likely amongst MBD adults.) Therefore, we know of many factors which contribute to the over-representation of the MBD syndrome amongst the poor. MBD as described in this paper accounts for 80% of the problems of school age children. It represents a population at risk for various negative adult outcomes which cost society a great deal of money. We can now identify the MBD case quite early in life; the challenge is to show that we can do something for these children and alter their dismal futures. Only one of these MBD children was seen in a child guidance clinic. What children are these clinics seeing?

Table I

Major Problems Displayed by 1113 School Children (Grades 1-6)

in Addison County, Vermont

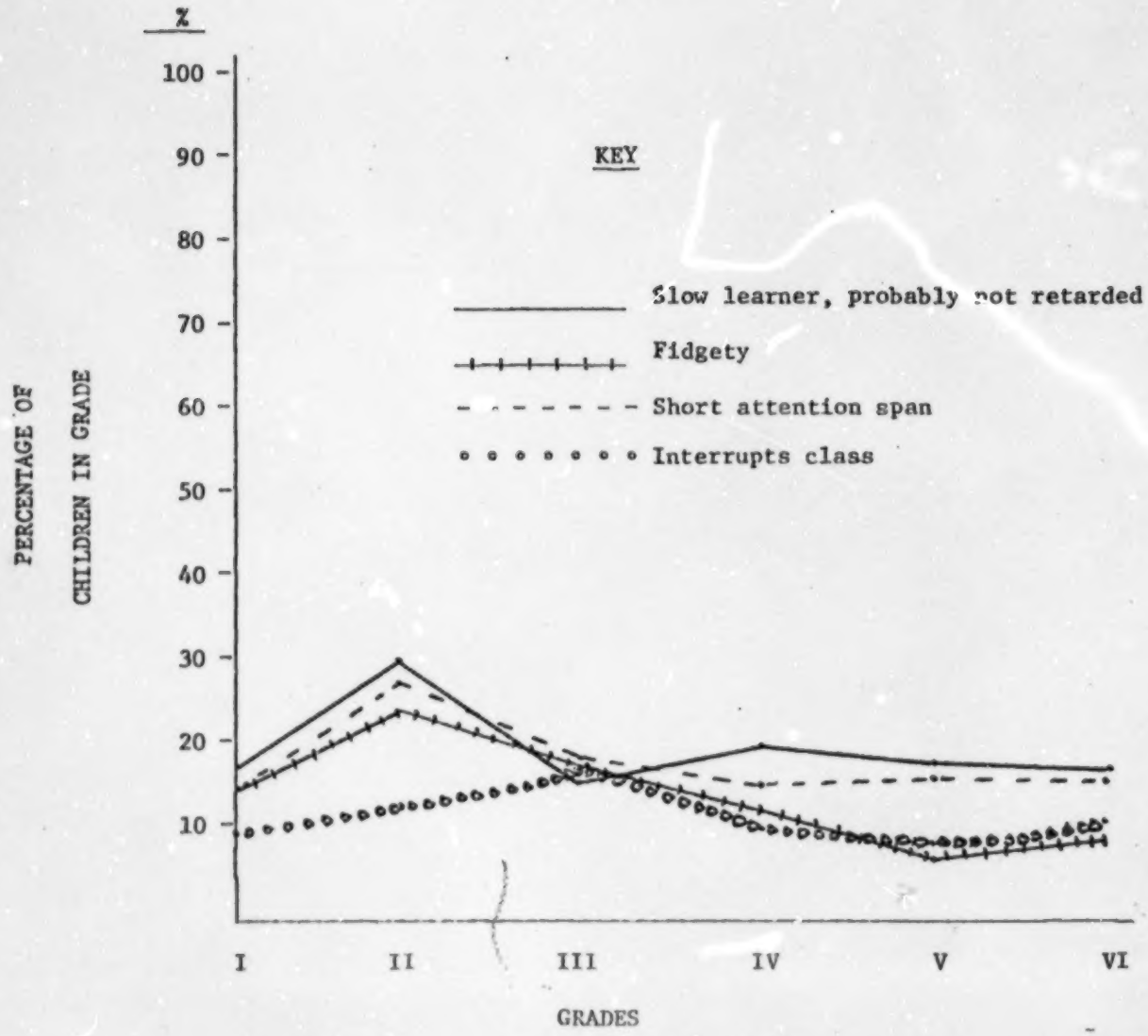


Table II

Of 84 children followed after 8 - 10 years:

9	Could not be located
18	Had been institutionalized
5	of these had been in two or more institutions
School dropout rate	21% versus expected 4%
Work record	24 satisfactory 13 poor

No relationship of drug response or length of use to outcome.

Table III

Group	Above 80 Percentile	%Children	%Boys	Mean IQ Scores	Grade Point Average	% of Group in Remedial Math	% of Group in Remedial English	% of Group in Advanced Math	% of Group in Advanced English	% of Children who repeated one or more grades	% of Children with poo or very p social adjustmen
A	2nd Grade only	17	60	97.8	2.22	47	24	6	6	47	0
B	4th Grade only	14	57	97.3	1.89	25	16	17	0	43	23
C	5th Grade only	17	76	98.4	1.93	31	50	0	0	29	59
D	2nd & 4th grades	13	62	90.0	1.95	45	18	0	0	82	25
E	2nd & 5th grades	10	70	83.9	1.90	44	55	0	0	67	20
F	4th & 5th grades	14	93	96.9	1.68	33	75	0	0	62	54
G	2nd, 4th & 5th grades	10	100	90.0	1.48	44	67	0	0	33	70
All Identified Children		95	73	95.3	1.90	38	42	5	1	50	35
All Controls		45	67	107.3	2.76	2	14	27	23	11	7
H	Percentile 0-30	22	68	114.1	2.97	0	5	36	32	0	0
I	40-70	23	65	100.7	2.55	5	23	18	14	22	13

TABLE IV

CLUSTER ANALYSIS OF TOTAL SCORES WITH 5 CLUSTER

CLUSTER NUMBER	NUMBER OF SUBJECTS	CLUSTER CENTERS		
		2nd grade	4th grade	5th grade
1	36	65.0	69.6	76.5
2	57	54.9	57.3	60.9
3	38	69.9	62.3	55.9
4	60	49.8	49.5	47.8
5	51	39.5	37.7	36.6
MEANS		54.3	53.8	54.1
ST. DEV.		12.0	12.6	14.0

(For all practical purposes a score of 66 represents the 80th percentile in each cas

Table V

Twelfth Grade

	% poor social adj	% remedial Eng	% remedial Math	% advanced Eng	% advanced Math	Mean Grade Eng	Mean Grade Math	Mean Grade GPA
No scores in 80th percentile	12	6	5	25	35	2.67	2.64	2.73
One or more scores in 80th percentile	29	11	12	2	0	1.76	1.54	1.79

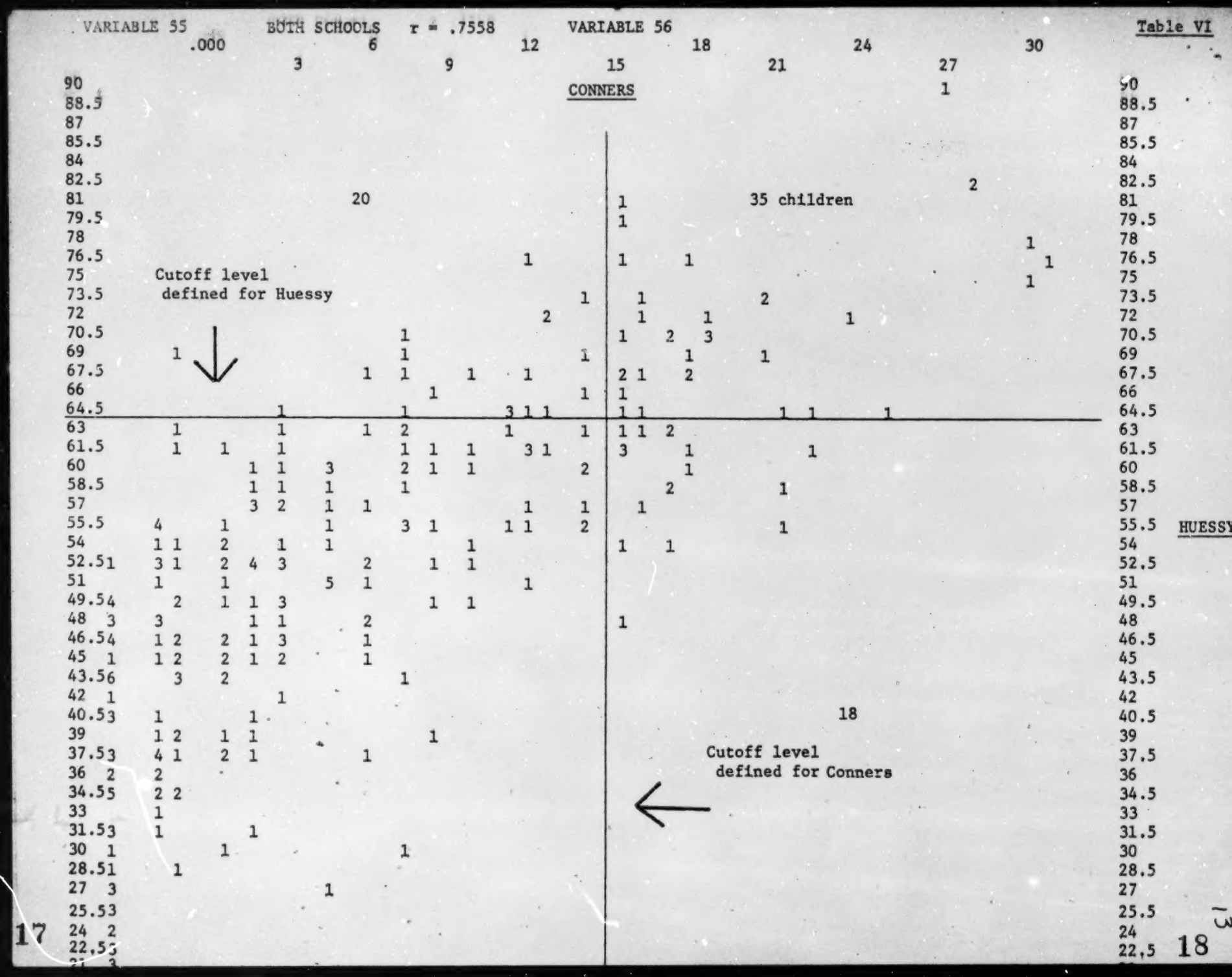

VARIABLE 55
BOTH SCHOOLS r = .7558
VARIABLE 56
Table VI
CONNERS
35 children
Cutoff level
defined for Huessy
Cutoff level
defined for Conners
HUESSY

Table VII

The 35% of the "hyperkinetic" children with social problems in ninth grade:

Suspended

Placed on social probation

Assigned detention

Offenses committed:

Truancy

Tardiness

Smoking in school

Cutting classes

Forging passes

Stealing

Discharging fire extinguishers

Disrupting the classroom

Defying school authorities

Teachers considered them:

Loud
Inattentive
Uncooperative
Lazy
Sneaky
Immature
Annoying
Inconsiderate
Unpredictable
Defiant
Easily discouraged
Easily distracted

In addition, teachers noted:

Daydream
Fool around
Disturb others
Seek attention
Respond poorly to discipline
Unable to sit still, concentrate, settle down and/or follow directions

None of the records of the control population contained comments similar to these descriptions.

Table VIII

	Imipramine (Tofranil)	Amitriptyline (Elavil)	Methylphenidate (Ritalin)	Dextroamphetamine (Dexedrine)	Diphenylhydantoin (Dilantin)	Pemoline (Cylert)	Methamphetamine (Desoxyn)	Total
No. of trials	55	26	28	17	13	2	1	142
No. of positive responses	26	12	13	9	7	0	1	68
No. of negative responses	10	7	6	3	2	1	0	29
No. of paradoxical negative responses	1	0	1	0	1	0	0	3
No. of no effect responses	21	8	9	5	5	1	0	49
No. of responses with pos-neg aspects	3	1	1	0	2	0	0	7
% positive responses	47.3	46.2	46.4	52.9	53.8	0	100	47.9

Drug		Imipramine	Amitriptyline	Methylphenidate	Dextroamphetamine	Diphenylhydantoin	Pemoline	Methamphetamine
Dosage For Males	Range (mg)	5-150	50-125	30-100	10-30	200-400	-	-
	Mean (mg)	90.9	90.6	56.7	16.2	300	-	-
Dosage For Females	Range (mg)	5-150	50-125	15-100	10-30	100-300	-	10
	Mean (mg)	74.0	78.1	42.5	20.0	200	-	10

Table IX

MBD

Makes it worse	Makes it better
Large family	Small family
N[illegible]tended family	Extended family available
Frequent moves	Much large muscle activity
Apartment living	Rigid social structure
Trailer living	Fully scheduled day
Emphasis on formal education	Single family homes
Open and diverse society	One to one teaching
Frequent conflicting messages	Tightly run classroom
Much free time	
Open classroom	

Table X

SYMPTOMS OF MBD AT DIFFERENT AGES

Infancy	Pre School	Elementary School
	High fevers	
	Accident-prone	Accident-prone
Restlessness	Into everything	Short attention span
Irritability	Short attention span	Daydreams (girls)
Irregularity	Destructive	Can't sit still (boys)
Excessive crying	Can't sit still	Low frustration tolerance
High fevers	Temper tantrums	Over-reacts
Poor eater	Speech problems	Learning problems
High activity level	Gets to sleep late or	Doesn't complete tasks
	Wakes up very early	Class clown
	Cruel to animals	Aggressive
	Aggressive	Poor peer relations
	Impulsive	Impulsive
	Trouble with groups	Poor self image
	Mood swings	
	Fire setting	
	Enuresis	
	Insensitive to pain	

High School	Adults
	Over-talkative
	Low stress tolerance
Educationally retarded	Easily distractable
Poor attention span	Impulsive
Lack of motivation	Short fuse
Unreliable	Explosive
Aggressive	Sleep problems
Impulsive	Mood swings
Over-reacts	Trouble with lasting relationships
Struggles with authority	Can't relax
Delinquent activity (boys)	Stretches the truth
Promiscuity (girls)	Trouble with groups
Mood swings	Alcohol abuse
Lies	Overly dramatic
Accident prone	Poor self image
Suicidal gestures	Exposes self (males)
Poor self image	Poor job performance
School drop out	Frequent arguments or fights

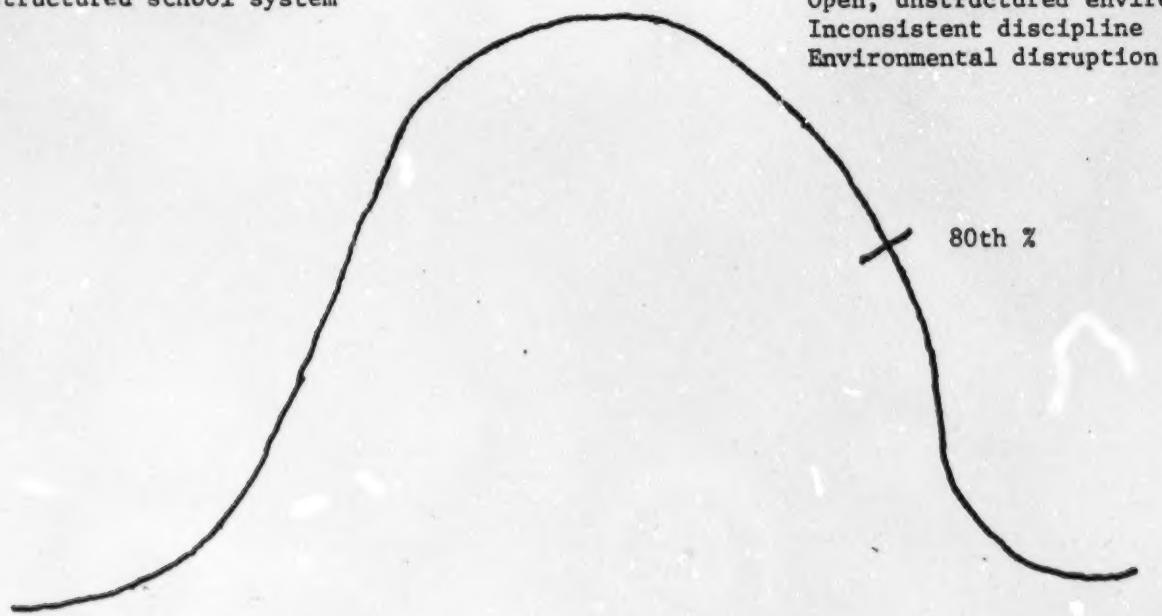
Table XI

Stable environment
Adequate economic resources
Well established routines
Predictable and consistent consequences
Parental stability
Well structured school system

1. Complications of pregnancy and delivery
2. Prematurity
3. Injuries and infections of brain
4. Poverty

} Causal association shown

Instability of parents
Open, unstructured environment
Inconsistent discipline
Environmental disruption



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